CLAIMS

I claim:

1. A process for converting gaseous alkanes to liquid hydrocarbons comprising:

reacting a gaseous feed having lower molecular weight alkanes with bromine vapor to form alkyl bromides and hydrobromic acid; and

reacting said alkyl bromides and hydrobromic acid in the presence of a synthetic crystalline alumino-silicate catalyst and at a temperature sufficient to form higher molecular weight hydrocarbons and hydrobromic acid vapor.

2. The process of claim 1 wherein said bromine vapor is substantially dry, thereby avoiding the formation of significant carbon dioxide along with said alkyl bromides.

3. The process of claim 1 wherein said gaseous feed is natural gas.

4. The process of claim 3 wherein said natural gas is treated to remove substantially all of the carbon dioxide and sulfur compounds therefrom prior to reacting with said bromine vapor.

5. The process of claim 1 wherein said temperature is from about 150° C. to about 400° C.

6. The process of claim 5 wherein said temperature is from about 250° C. to about 350° C.

7, The process of claim 1 wherein said crystalline alumino-silicate catalyst is a zeolite catalyst.

8. The process of claim 7 wherein said zeolite catalyst is a ZSM-5 zeolite catalyst and said higher molecular weight hydrocarbons contain a C_7+ fraction that is composed primarily of substituted aromatics.

9. The process of claim 8 wherein said ZSM-5 zeolite catalyst is modified with at least one modifying cation selected from hydrogen and Group IA alkaline metals, or Group IIA alkaline earth metals.

10. The process of claim 9 wherein said ZSM-5 zeolite catalyst is modified by ion exchange with at least one cation selected from hydrogen, sodium, potassium, cesium, magnesium, calcium or barium.

11. The process of claim 1 further comprising:

removing said hydrobromic acid vapor from said higher molecular weight hydrocarbons by neutralization reaction with an aqueous solution containing reaction products obtained by oxidizing an aqueous solution containing a metal bromide salt, the metal of said metal bromide salt being selected from Cu, Zn, Fe, Co, Ni, Mn, Ca or Mg bromide.

12. The process of claim 1 wherein said bromine vapor is produced by oxidizing an aqueous metal bromide salt solution, the metal of said metal bromide salt being selected from Cu, Zn, Fe, Co, Ni, Mn, Ca, or Mg.

13. The process of claim 1 further comprising:

removing said hydrobromic acid vapor from said higher molecular weight hydrocarbons by dissolution into water forming hydrobromic acid, said hydrobromic acid solution being neutralized by reaction with an aqueous solution containing a metal hydroxide obtained by oxidizing an aqueous metal bromide salt solution with oxygen, the metal of said metal bromide salt being selected from Cu, Zn, Fe, Co, Ni, Mn, Ca or Mg.

14. The process of claim 1 wherein said hydrobromic acid vapor is removed from said higher molecular weight hydrocarbons by dissolution into water forming hydrobromic acid, said hydrobromic acid solution being vaporized and reacted with a metal oxide, said metal oxide being obtained by oxidizing a metal bromide salt contained on a porous support, the metal of said metal bromide salt being selected from the group Cu, Zn, Fe, Co, Ni, Mn, Ca or Mg.

15. The process of claim 1 wherein said bromine vapor is produced by oxidizing a metal bromide salt contained on a porous support, the metal of said metal bromide salt being selected from the group Cu, Zn, Fe, Co, Ni, Mn, Ca, or Mg.

16. The process of Claim 1 wherein said higher molecular weight hydrocarbons contains a C_3, C_4 and C_5+ fractions in admixture with excess lower alkanes, the process further comprising:

dehydrating said higher molecular weight hydrocarbons to a dew point of about –20° C. or less so as to recover said C_5+ fractions as a liquid.

17. The process of claim 16 further comprising:

mixing at least a portion of said C_3 and C_4 fractions with said alkyl bromides and said hydrobromic acid prior to the step of reacting over said synthetic crystalline alumino-silicate catalyst.

18. A process for converting gaseous lower molecular weight alkanes to liquid hydrocarbons comprising:

reacting a gaseous feed containing lower molecular weight alkanes with bromine vapor to form alkyl bromides and hydrobromic acid;

reacting said alkyl bromides and hydrobromic acid in the presence of a synthetic crystalline alumino-silicate catalyst to form higher molecular weight hydrocarbons and hydrobromic acid; and

converting said hydrobromic acid to bromine.

19. The process of claim 18 further comprising:

dehydrating said higher molecular weight hydrocarbons.

20. The process of claim 18 further comprising:

recycling said bromine that is converted from said hydrobromic acid to said step of reacting with said gaseous feed, said bromine being recycled as a vapor.